

## CHAPTER 2

### WAREHOUSES

2-1. Functions. This chapter covers site-planning requirements for general-purpose warehouses. Not included in this chapter are special storage areas such as chemical, radiological, or flammable materials that have special requirements.

#### 2-2. General.

a. Large depots. A centralized shipping and receiving terminal within the depot is efficient for large depots. Centralization allows for the receipt of all less-than-carload-lot material at one area, thereby consolidating movement of commercial carriers to one terminal and dispatch yard while also allowing yard carriers efficient movement of goods to storage warehouses once the material has been sorted at the receiving terminal. This concept also reduces the need for sophisticated MHE in remote warehouses; similarly, efficient movement of goods from warehouse to shipping terminal to commercial carrier is utilized.

b. Location. The location of the shipping and receiving terminal should be central to the warehouses that it must serve. It should also be located close to a depot entrance in order to simplify interaction with commercial carriers. Area should be provided for a dispatching yard, commercial truck parking, and trailer storage. Access to rail shipping and receiving yards should also be convenient.

c. Small depots. If the depot is small or has a mission of mainly storage, a centralized shipping and receiving terminal may not be economical. In these cases the area of each warehouse that is set up to receive or ship goods can act in this capacity.

#### 2-3. Centralized shipping and receiving terminals.

a. Factors in design. Centralized shipping and receiving terminals are designed for efficient flow of material, rather than for efficient storage as is the case for general storage warehouses.

b. Dispatch yard. The most efficient method of truck dispatching uses a dispatch yard with a dispatch office to organize incoming and outgoing trucks. The yard should be close to the receiving and shipping terminal so that the dispatch officer can have visual as well as audio communication with the terminal. The size of the dispatch yard will depend upon the shipping and receiving requirements of the depot but should contain enough parking area to store trailers after they have been unloaded and before they are reloaded, as well as

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acreage for trucks to wait while they are in line for a dock space. The storage area should be marked to designate parking areas and travel lanes. Sufficient roadway width should be provided to allow easy movement of trailers by either commercial or yard cabs. Pavement thicknesses should be designed for heavy-duty traffic use and should comply with the criteria of EM 1110-3-131 for flexible pavements, and EM 1110-3-132 for rigid pavements. If site conditions allow, both the central shipping and receiving terminal and its dispatch yard should be close to an entrance to the depot to reduce commercial truck traffic throughout the depot and to minimize confusion of drivers as to their depot destination.

c. Commercial carrier access. Both the shipping and receiving portions of the terminal should have access to truck and rail transportation. The most efficient design would allow trucks on one side to park side by side and open their tail doors onto the loading dock. The rail side of the building should be designed according to the spacing of doors on rail cars. On the rail side of the building, the area between the rails can be paved so that this side of the building can be used for truck access when not being used by rail cars. Additional accessible dock space may be necessary to utilize the maximum number of trucks on this side. Concrete pads should be provided where the dolly wheels rest to prevent the trailer from sinking into the asphalt.

2-4. Dock space. Dock space for shipping and receiving terminals is the same as that for most general purpose warehouses. Heights and alignment capabilities of docks will be a part of the warehouse design. Dock widths should be wide enough to allow efficient maneuvering of forklift trucks and other expected types of MHE. Lighting should be installed on outside docks to allow nighttime operations. At the ends of the building, all docks should terminate in ramps to the street in order to facilitate interwarehouse movement of goods for forklift or cart.

2-5. Shipping and receiving areas in individual warehouses. Since the activity of shipping and receiving in individual warehouses is less than at central terminals, the size of the dock space can be reduced proportionally. If it is anticipated that the storage mission of the warehouse under design will be long-term storage with only minor shipping and receiving activities, truck berthing space can be reduced to several berths adjacent to the shipping and receiving area. If more active movement of goods is anticipated and it would be more efficient to unload trucks directly outside of the area of the warehouse in which they will be stored, full-length loading docks can be maintained along the entire length of the building. On the rail side of the warehouse it will generally be more efficient to use docks the entire length of the building because of the orientation of the cars for unloading and loading purposes.

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## 2-6. Storage sheds.

a. Types. Sheds are covered storage buildings either of the portable or permanent types, having incomplete exterior walls. Portable or transitory sheds are a prefabricated metal type of shelter that can be dismantled and moved to a more convenient location for reassembly. Due to their transitory nature, these types of sheds seldom have any utilities. Permanent sheds are permanently anchored to the foundation and more likely to have utilities such as lighting and fire sprinkler systems.

b. Location. Sheds should be constructed on high ground, remote from water areas, and on terrain that is well drained to carry runoff away from the base of the structure. The ground should be level beneath the structure so that material stored on grade in a shed with unimproved base will not become unstable under high stacking loads. The grounds around the shed should be cleared of brush and low growth since these conditions reduce ventilation and provide cover for pests. Sheds should be oriented in a manner similar to warehouses, with access to rail on one side and truck on the opposite.

## 2-7. Sprinkler systems.

a. Requirements. Sprinklers are required in warehouses, sheds (including transit and pier sheds), and similar types of storage buildings containing supplies of a critical nature, of severe fire hazard, of high monetary value, or of vital importance. Sprinkler requirements will follow the guidance of the National Fire Code standards for sprinkler systems. Generally warehouse buildings will fall in the category of ordinary hazard, Group 3, based on NFPA 13.

b. Additional fire fighting requirements. Additional fire fighting protection will be supplied by small hose and fire extinguishers. Fire hydrants should be located at entrances to the warehouse, especially in warehouses that do not have any windows in the walls. Detailed reference to fire hydrants can be found in EM 1110-3-164.